INTERNATIONAL JOURNAL
OF
CONSERVATION SCIENCE

ISSN: 2067-533X Volume 15, Issue 2, 2024: 1047-1064 www. ijcs. ro

DOI: 10. 36868/IJCS.2024.02.20

DIVERSITY, INDIGENOUS USES AND CONSERVATION STATUS OF PLANTS USED IN SOCIO-CULTURAL TRADITIONS BY KINNAURA TRIBES OF HIMACHAL PRADESH, INDIA

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Abstract

Himachal Pradesh, one of India's Western Himalayan states, is well-known for its distinct culture, traditions and vegetation. Kinnaura is a major tribal community of Himachal Pradesh and for ages, these people are highly dependent on locally available plant resources for fulfilling daily livelihood needs including socio-cultural traditions. Therefore, an effort has been made to; (i) assess the diversity and utilization pattern of plant resources in socio-cultural traditions; (ii) identify endemism and nativity and the threat status of these species; and (iii) suggest management options for conservation. A total of 105 species belonging to 79 genera and 39 families representing trees (14 species), shrubs (17 species), herbs (73 species) and one climber were recorded. Among these, fifty-two species were native to the Himalayan region and fifteen species were near-endemic. Flowers of plants are used in the majority. Among these, eighteen species are in the various threat categories of threatened species. Due to increasing demand, habitat destruction and overexploitation, the population of the preferred species are depleting rapidly. Therefore, assessment of natural populations, demand and supply studies, harvesting trends, developments of propagation methods, afforestation of highly preferred species and community awareness for sustainable utilization and conservation of traditional knowledge have been suggested.

Keywords*: Diversity; Festivals; Kinnaura tribes; Socio-cultural traditions; Nativity; Endemism; Threat Status; Indian Himalayan Region*

Introduction

Indigenous and tribal communities worldwide have a close connection to the natural world and use various plant parts in traditional rituals, especially for worshipping deities [1]. Natural plant resources are deeply associated with their sentiments and influence their culture, customs, rituals, rites and ethos [2]. Plants have various cultural aspects, such as art, religion, language, politics, history and social structure [3]. India is one of the major countries of the world having a rich repository of floristic diversity along with diverse ethnic groups having vast traditional knowledge related to the use of plant species and also having a rich and diverse heritage of cultural traditions [4]. Traditional ceremonial beliefs of tribes are one of the crucial tools for comprehending tribal communities and the conservation of plant diversity [5]. Making management decisions to ensure or improve the availability of desired plant resources consequently requires consideration of human cultural values and traditional ecological knowledge of plant resources [6, 7]. One understudied aspect of biocultural variety that has evolved over time within a complex socio-ecological system is the use of plants in socio-

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cultural rituals [8] although rituals contribute significantly to the history and cultural identity of tribal communities.

Ethno-botanical research can provide information about the cultural significance of plants and natural forests [9]. *I.H. Sutrisno et al.* [10] in their studies in the Peureulak sub-districts of East Aceh district, Indonesia recorded a total of 51 plant species (47 genera and 34 families) commonly used in ritual ceremonies of which 92% were cultivated and 8% were wild. The majority of the plants (18 species) were utilised in marriage ceremonies, then birth (8 species), death (5 species) and pregnancy ceremonies (3 species). *N. Stryamets et al*. [11] documented 86 plants from the Bukovinian Hutsuls and Roztochya region of Western Ukraine which were commonly utilized by communities, especially in religious festivals. *Ficus religiosa, Centella asiatica, Curcuma longa*, *Azadirachta indica*, *Ocimum tenuiflorum* and *Cynodon dactylon* are the species which are commonly used in marriage and other religious ceremonies in India [12-13]. In the Indo-Gangetic plain of India *Musa balbisiana, Aegle marmelos, Azadirachta indica, Ocimum tenuiflorum, Phyllanthus emblica, Nelumbo nucifera, Calotropis gigantean, Prosopis cineraria* and *Ficus religiosa* are associated with God and Goddess whereas *Azadirachta indica, Ficus benghalensis, Ficus religiosa, Phyllanthus emblica, Ocimum tenuiflorum* are commonly used in festivals [14]. Apatanis tribes of Arunachal Pradesh use Bamboo, Canes and *Castanopsis* spp., *Magnolia* spp. and *Pyrus* spp. for performing various traditional rituals [15]. In Telangana state Tanner's Cassia, Celosia, Merigold and Chrysanthemum flowers are used for the celebration of the Bathukamma festival [16].

In the Indian Himalayan region traditional use of plants for worshipping deities and other auspicious ceremonies viz., such as birth, death, festivals, weddings *etc*., is quite common [17]. For example, plants like *Nardostachys grandiflora, Morina coulteriana*, *M. longifolia* and *Jurinea macrocephala* are commonly used as incense by local inhabitants for worshipping deities in their houses and temples [18, 19]. In the Western Himalayan Region of Jammu and Kashmir, *S.M. Haq et al*. [20] conducted a cross-cultural assessment of plant resources across five ethnic communities. They reported 127 plant species that the local ethnic groups used for various purposes (such as medicine, herbal tea, fuelwood, fodder, food and spiritual purposes). The Gujjar ethnic group was reported to use the most plant species (25%) followed by the Pahari (24%) and the Dogra (12%) used the fewest species. *Amaranthus blitum*, *Azadirachta indica*, *Brassica campestris, Celtis australis* and *Ulmus wallichiana* were used for magico-religious purposes.

S. Thakur et al. [21] reported 75 species belonging to 46 families from the Kullu district of Himachal Pradesh used by locals due to magico-religious beliefs along with their medicinal value. In the Kashmir valley, there are 75 edible species that are employed in traditional meals; among those 27 species were vegetables, 20 fruits, 13 spices, 12 birds, 6 animals and 5 fish species. Kashmiris were the ethnic group that reported using the most species, while Gujjars used the fewest species. Festivals and marriages displayed more species usage similarities than funerals and marriages during cultural usage, which exhibited the least overlap between the two. Festivals and weddings shared the most similarities with regard to ethnic recipes, whereas festivals and funerals had the least [22]. There are 14 different tribal communities living in Himachal Pradesh, *viz*., Pangwals, Swangla, Lahaula, Bhot, Gaddi, Gujjar *etc*. [23]. These tribal communities have a rich cultural heritage and are stewards of indigenous traditional knowledge related to their biological resources due to their unique costumes, dialects, traditions and customs [24]. *S. Thakur et al.* [25] recorded 45 species from Tirthan Wildlife Sanctuary, Kullu, Himachal Pradesh having religious importance. Thirty-three sacred plant species (trees 6, shrubs 16 and herbs 11) had been reported from the Kanawar Wildlife Sanctuary of the Himachal Pradesh used in religious ceremonies [26].

Nowadays, traditional knowledge of local communities in many places is said to be declining as a result of technological and information developments [9, 27, 28]. Moreover, there is little written information about the usage of plants in traditional ceremonies and most

knowledge is down from generation to generation verbally [29]. The review of the literature revealed that detailed studies on plants used in traditional rituals, especially for birth, death, marriage, fairs and festivals in district Kinnaur have not been documented so far. Therefore, the present study is undertaken to document the diversity, distribution, indigenous uses and conservation status of plants used in socio-cultural traditions by Kinnaura tribes of Himachal Pradesh.

Materials and Methods

Study area

Himachal Pradesh, the land of snowy mountains, has 12 districts. Kinnaur district is one of the tribal districts of Himachal Pradesh which is located on both sides of the Satluj River from 31º55'50" N to 32º05'15" N latitudes and 77º45'00" E to 79º00'35" E longitudes (Fig. 1). It shares its eastern border with the Ngari region of western Tibet; Uttar-Kashi district of Uttarakhand and Rohru tehsil of Shimla district in the south; Kullu and Rampur regions in the west and in the north Spiti region of Lahaul and Spiti district.

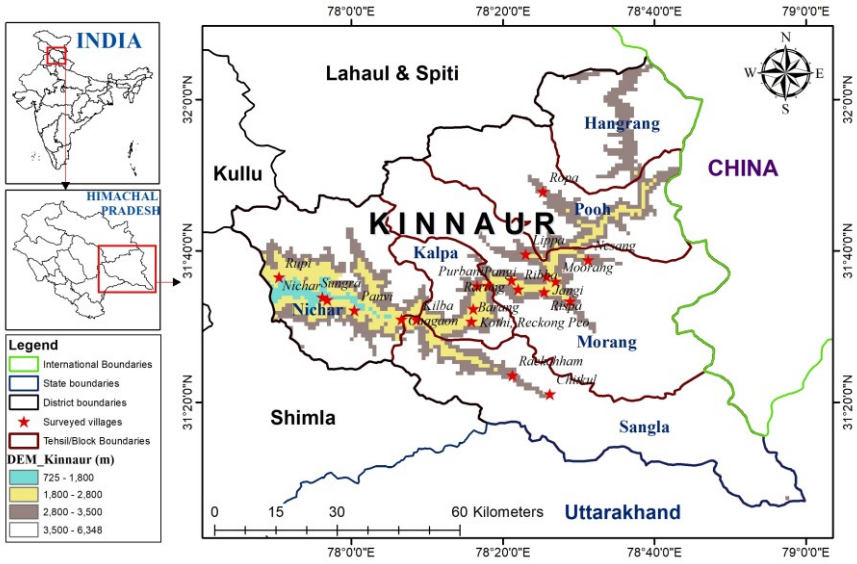

Fig. 1. Map of the study area, Kinnaur district in Himachal Pradesh

The main river, the Satluj, enters the district from the northeast, near Namgaya, at an elevation of 3,050m amsl and it exits at Chauhra, at an elevation of 1,320m amsl. The region's climate is dry temperate. Due to heavy snowfall during winters, the region remains geographically isolated from other parts of the state. Based on climatic conditions region is divided into four zones viz., wet (i.e., Nichar and Sangla), dry (i.e., Kalpa and Morang), semiarid (i.e., Area south of the Great Himalayan range) and arid (Pooh) characterized by long winter from October to April and short summer from May to August. According to the Indian State of Forest Report (ISFR-2021) [30] the total area of forest in the district Kinnaur is 645.31 km^2, which is 10.8% of the total geographical area viz., 6401km^2. The wide ranges of altitudinal and climatic geospatial gradients have endowed the area with rich floristic diversity. Major tree species of the area are *Pinus gerardiana, Cedrus deodara, Pinus wallichiana, P. roxburghii, Picea smithiana*, *Abies pindrow, A. spectabilis, Quercus semecarpifolia*, *Q. oblongata*, *Q. ilex*, *Juniperus polycarpos*, *Aesculus indica*, *Olea ferruginea, Celtis australis, Prunus cornuta,*

Fraxinus xanthoxyloides, Salix spp., *Juglans regia, Prunus armeniaca, Prunus mira, Betula utilis, Alnus nitida* and *Robinia pseudoacacia*. Whereas *Artemisia maritima, A. vestita, Ephedra gerardiana, Lonicera quinquelocularis, L. hypoleuca, Juniperus indica, J. communis, Rosa webbiana, Berberis lycium, Arundo donex, Colutea nepalensis, Indigofera heterantha, Rubus* spp., *Desmodium* spp., *Sorbaria tomentosa, Cotoneaster nummularis* and *Daphne oleoides* are major shrubs and *Taraxacum officinale, Primula denticulata, Thalictrum foliolosum, Thalictrum virgatum, Tragopogon gracilis, Epilobium* spp., *Anaphalis* spp., *Potentilla* spp., *Gentiana* spp., *Chenopodium* spp., *Senecio desfontainei*, *Erigeron annuus*, *Cannabis sativa*, *Dianthus orientalis, Bidens* spp., *Veronica persica*, *V. polita*, *Geranium* spp., *Malva* spp., *Trifolium repens, Verbascum thapsus, Urtica dioica, Oxyria digyna, Silene vulgaris, Trifolium pratense, Oxalis* spp. and *Impatiens* spp., are the major herbs.

Methods

The current research is based on extensive and intensive surveys done between 2022 and 2023 in the representative 21 tribal villages/panchayats namely, Chhitkul, Chagaon, Rackchham, Rarang, Rispa, Jangi, Morang, Nesang, Lippa, Kothi, Barang, Pangi, Nichar, Rupi, Panvi, Sungra, Kilba, Ropa, Ribba, Thangi and Purbani villages of Kinnaur district in Himachal Pradesh. The usual personal observations, oral interviews and discussions with the tribal communities of respective villages were the bases of the collection of information about the plants used in socio-cultural traditions by the Kinnaura tribes of Himachal Pradesh. A total of 66 respondents were interviewed, of which 86% were males and 14% were females. From each village, 2-5 knowledgeable people were interviewed through a semi-structured questionnaire. The informants ranged in age from 30 to 85 years old and included men, women, children and elderly people. The questions were mainly for the information generation on species used in socio-cultural traditions. For information generation, questions related to the plants used in socio-cultural traditions were asked in the local dialect and Hindi as well. The plant specimens were collected, dried, identified and preserved using standard botanical collecting and herbarium techniques [31] in the Herbarium at Himalayan Forest Research Institute, Shimla, India. In the laboratory, samples of collected trees, shrubs, herbs and climbers were identified with the help of regional [32] and local flora [33-37]. For the nomenclature of the species, The World Flora Online (website: http://www.worldfloraonline.org) has been followed. The nativity of the species was identified by following Samant [38] and threat status by following the IUCN red list and CAMP 2010 [39]. The species which were cultivated/ornamentally but utilized by the tribal communities in the socio-cultural traditions have been also included.

Results and discussion

India is renowned for having a wide variety of flora, religions, rituals, mythology, dialects and other aspects of culture. The tribal society of the western Himalaya is mostly traditional and reflects man's cultural connections with nature. The foundation for sustainable forest management is an understanding of the interrelationships between ecological and social processes and traditional societies' religions and cultures place a strong emphasis on resource protection and preservation [40]. In such an integrated management strategy, socioeconomic and sociocultural challenges, as well as traditional knowledge of local inhabitants, must be reconciled [41, 42]. Traditional mountain communities have a crucial function in maintaining the wellness of forest ecosystems, but as the population continues to rise, many secondary types are facing pressure. As a result, there is an urgent need for a better understanding of the interactions among social and biophysical processes [43].

Knnaur district is one of the remotest tribal districts of Himachal Pradesh and the inhabitants of the area are known as ‘Kinnaura’ the third largest populous tribe of Himachal Pradesh. These tribes belong to the Aryan Mongolian mixed race and Khoshiya, Chamang, Domang and Ores are the main socio-cultural groups. The Khoshiya are the main cultivators

with 74% population of the area whereas Chamang, Domang and Ores have the specialized skill of carpenters, masons, blacksmiths, weavers, drummers, tailors and leather work. Kinnaura people are known for their unique traditional woollen attire, particularly cap of the greyish or brown colour woollen cap with a green velvet band on the outer fold with a bunch of flowers of *Oroxylum indicum* (Chamakha) which distinguishes them from the rest of the communities of the state. They speak their unique dialect known as Kinnauri (Jangshung, Chitkuli, Sumcho, Sunnam, Bhoti, Chhoyuli) and their dialects change from village to village and valley to valley. Kinnaura tribes are highly dependent on natural plant resources to perform various traditional rituals, especially for birth, death, marriage, fairs and festivals. They are also very fond of music, dance and singing and they celebrate many festivals throughout the year in which many plants (cultivated and wild) are used in performing various rituals. Both Hindu and Buddhist rituals are performed by the Kinnaura tribes in birth, death, marriage and other socio-cultural activities. Due to this, these native people are the custodians of unique indigenous traditional knowledge associated with their culture and surrounding biological resources. *Fagopyrum esculentum, F. tataricum, Hordeum vulgare, Triticum aestivum, Pisum sativum, Vicia faba, Solanum tuberosum, Amaranthus* spp., *Phaseolus vulgaris* and *Zea mays* are major agricultural crops whereas *Malus pumila, Prunus armeniaca, Prunus amygdalus, Pyrus pyrifolia, Juglans regia, Prunus persica, Prunus domestica* are the major horticultural crops of the area.

The present study shows that a total of 105 plants (Angiosperms 99 and Gymnosperm 06), belonging to 79 genera and 39 families were associated with the sacred belief and utilized by locals in religious functions, rituals and also in celebration of festivals. Of these 73 species are herbs, shrubs 17, trees 14 and climber (1 species) (Tables 1 and 2). Among families, Asteraceae (12 species), Ranunculaceae (9 species), Rosaceae (8 species), Poaceae (7 species), Polygonaceae (7 species) and Fabaceae (6 species) have a maximum number of species in use. Twenty families have one species only in use. Amongst genera, *Delphinium, Juniperus, Pedicularis, Primula, Rhododendron* and *Saussurea* contribute more species.

Table 1. Taxonomic groups of plant diversity used in socio-cultural traditions by Kinnaura tribes

	Families	Genera	Species	Trees	Shrubs	Herbs	Climber
Angiosperms	37	76	99	10	15	73	1
Gymnosperms	2	3	6	4	2	-	-
Total	**39**	**79**	**105**	**14**	**17**	**73**	**1**

Table 2. Plants used in socio-cultural traditions by Kinnaura tribes of Himachal Pradesh, India

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
Angiosperms						
Amaryllidaceae						
Narcissus tazetta L.	Narkasang	H	1320-3000	Reg Mediterr	Flowers, Leaves	Leaves are used for the preparation of 'Mahadev' in the Shivratri festival. Flowers are offered to deities in Raulane, Beesh and Nar Beesh festivals and women also wear them on their caps.
Apiaceae						
Cortiella hookeri (C.B. Clarke) C. Norman	Pau	H	4300-5500	Reg Himal	Flowers	Used for the preparation of bouquets (Chera) for worshipping deities in Phulaich and Dakhrain festivals.
Ferula jaeschkeana Vatke	Ked	H	2500-3600	Himal Bor Occ Turkestan	Twigs, Leaves	Used for worshipping deities in the Beesh festival and people also wear them on their caps.

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
Hymenidium brunonis Lindl.	Pagu, Shpo	H	3300-4500	Reg Himal	Flowers	Used for the preparation of bouquets (Chera) in Phulaich and Dakhrain festivals and for worshipping deities.
Hymenolaena candollei DC.	--	H	3000-5000	Reg Himal	Flowers	People wear it on caps at the Phulaich festival.
Ligusticopsis wallichiana (DC.) Pimenov & Kljuykov	Bhutkeshi	H	1400-4200	China Myanmar Reg Himal	Flowers	Used in Buddhist religious ceremonies especially to keep away evil spirits.
Apocynaceae						
Wattakaka volubilis Stapf	Bakhri Khan	Sh	700-1600	Ind Or	Silky hairs of Seeds	Locals collect it from warmer areas of the state and silky hairs of seeds are dyed with different colours and flowers are made which is known as 'Bakhri Khan'. Locals wear it on caps in marriage and birth celebrations.
Araliaceae						
Hedera nepalensis K. Koch	Lacha	C	1350-3000	Reg Himal	Leaves	Used in the Shivratri festival for the preparation of 'Mahadev' and also used in purification ceremonies.
Asteraceae						
Anaphalis triplinervis Sims ex C.B. Clarke	Palas chee	H	1800-3600	Reg Himal	Flowers	Used in Phulaich and Dakhrain festivals for worshipping deities.
**Calendula officinalis* L.	Thopare, Dopare	H	1350-2800	Europe Austr	Flowers	Women wear it on caps in Narbeesh and Beesh festivals.
**Chrysanthemum morifolium* Ramat.	Golbasi	H	1400-2900	China	Flowers	Offered to deities in Phulaich, Diwal and Nar Beesh festivals.
**Dahlia pinnata* Cav.	Halu Uh	H	1359-2500	Amer	Flowers	Used in marriage, death, birth and other religious functions.
Erigeron multiradiatus (Lindl. ex DC.) C.B. Clarke	--	H	2000-4500	As Trop	Flowers	Used in Phulaich festival.
Jurinea macrocephala DC. [#]	Guglang, Gulang	H	3000-4700	Persia	Roots	Used as incense in temples and houses, especially in Phulaich and Dakhrain festivals.
Saussurea gossypiphora D. Don	Khaspal	H	3500-5200	Reg Himal	Flowers	Used for the preparation of bouquets (Chera) for worshipping deities in Phulaich and Dakhrain festivals.
Saussurea simpsoniana (Fielding & Gardner) Lipsch.	Bena Khaspal	H	3800-5600	Reg Himal China	Flowers	Used for the preparation of bouquets (Chera) for worshipping deities in Phulaich and Dakhrain festivals.
Himalaiella heteromalla (D. Don) Raab-Straube[#]	Khasbal	H	3000-4000	Reg Himal	Flowers	Used for the preparation of bouquets (Chera) for worshipping deities in Phulaich and Dakhrain festivals.
Saussurea obvallata (DC.) Edgew.	Rongol, Shulo, Donger, Rongor, Tonor	H	3500-4800	Reg Himal	Flowers	Flowers are used for the preparation of bouquets (Chera) in Phulaich and also used in performing various rituals in Sazo, Dakhrain, Jagang, Sazo,

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
						Lohri, Ho Ho and Rang Koching festivals. On the second day of the Phulaich festival, flowers are also distributed to every villager and villagers keep them in their houses till next year for good fortune and prosperity and to keep away evil spirits.
**Tagetes erecta* L.	Kusumbur	H	1350-3200	Mexico	Flowers	Used in marriage, death, birth and other religious functions.
**Tagetes patula* L.	Thangra	H	1350-3000	Mexico	Flowers	Used in marriage, death, birth and other religious functions.
Betulaceae						
Betula utilis D. Don	Shak, Padh, Bhojptra	T	2100-4200	Reg Himal Japan	Branches	Used for worshipping deities in Phulaich, Dakhrain and Sholing festivals.
Bignoniaceae						
Oroxylum indicum (L.) Benth. ex Kurz	Chamkha	T	700-1200	Indian subcontinent	Winged Seeds	Locals collect it from warmer parts of the state and use it for the preparation of flowers known as 'Chamkha'. Locals wear it on caps, especially at marriages, births, festivals and other functions.
Boraginaceae						
Arnebia euchroma I.M. Johnst.	Rattanjot	H	3500-4000	Reg Himal Turkestan	Roots	In Buddhist birth and death rituals, it is used as colour 'Khome' on *Hordeum vulgare* flour balls known as Torma.
Cannabaceae						
Cannabis sativa L.	Sulfa	H	1320-2800	As Centr Himal Bor Occ	Leaves	Offered to Lord Shiva in Shivratri festival. In the Badrang Neeza festival leaves are hung on main doors to keep away evil spirits.
Caprifoliaceae						
Zabelia triflora (R.Br.) Makino	Bang	Sh	1500-4200	Reg Himal	Twigs	In the Dakhrain festival, it is offered to deities and people also dance by wearing garlands made of twigs on their foreheads.
Morina longifolia Wall. ex DC.[#]	--	H	2800-4200	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus and Kangyur Parikarma festival.
Cyperaceae						
Carex nivalis Boott[#]	Rog Seelang	H	3800-4900	Reg Himal	Flowers	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival and are also offered to deities. At the end of the festival, flowers are distributed among the villagers.
Ericaceae						
Rhododendron anthopogon D. Don	Tolo, Toloshing	Sh	3000-4900	As Bor Reg Himal	Flowers	Used in havans and other religious ceremonies.
Rhododendron arboreum Sm.	Burasang	T	1320-2300	Ind Or Reg Himal Zeylan	Flowers	Used in the Baisaki festival to decorate the house and also offered to deities.
Rhododendron campanulatum D. Don	Sairmanang	T	2600-4500	Reg Himal	Flowers	Women wear it on caps during its flowering time.

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
Cassiope fastigiata D. Don[#]	Tishur, Muteshang	H	2800-4500	Reg Himal	Leaves	Used as incense in temples especially in Phulaich and Dakhrain festival.
Fabaceae						
Ototropis elegans (DC.) H. Ohashi & K. Ohashi	Mus	Sh	1320-3600	Reg Himal	Twigs	Used for tying the flakes of Chilgoza torchwood (Sang) for performing a special torchwood dance (Sang Puling Chasham) on first day of the Phulaich festival.
**Glycine max* (L.) Merrill	Bothang	H	1350-2000	As Trop	Seeds	Used for worshipping deities in Losar, Lamoch, Misto and Phulaich festivals.
Indigofera heterantha Wall. ex Brandis	Kasting	Sh	1500-3000	Reg Himal	Twigs	Used for tying the flakes of Chilgoza torchwood (Sang) for performing a special torchwood dance (Sang Puling Chasham) on the first day of the Phulaich festival.
Lotus corniculatus L.	--	H	1500-3500	Europe	Flowers	Women wear it on caps in the Aasharang Ramdus festival.
**Pisum sativum* L.	Nyar	H	1350-4400	Europe As Bor	Seeds	Used for worshipping deities in the Misto festival.
**Vicia faba* L.	Chestan	H	2000-3500	Europe	Seeds	Used for worshipping deities in the Mang Neeza festival.
Fagaceae						
Quercus ilex L.	Brey	T	2000-2500	Reg Mediterr Oriens	Branches	Used for performing sacred rituals especially to keep away evil spirits.
Fumariaceae						
Corydalis govaniana Wall. [#]	--	H	2400-4800	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Gentianaceae						
Gentiana phyllocalyx C.B. Clarke	Chitjong	H	3600-5500	Reg Himal China	Flowers	Garlands are made from flowers and offered to deities in the Phulaich festival.
Geraniaceae						
Geranium pratense L.	--	H	2800-4500	Europe Asia	Flowers	Locals wear it on caps in Aasharang Ramdus.
Geranium wallichianum D. Don	--	H	2000-3600	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Juglandaceae						
**Juglans regia* L.	Ka	T	1350-3500	As Occ Reg Himal	Nuts	Garlands made from kernels are used in marriages and birth and death ceremonies. The wood is used in the preparation of palanquins of deities. Seeds are used for preparation of garlands known as 'Ka Maling' which is given to the bride, groom, family members and guests as a token of love and respect.
Lamiaceae						
Prunella vulgaris L.	--	H	1400-4000	Reg Temp	Flowers	Locals wear it on caps in Aasharang Ramdus.
Oleaceae						
Fraxinus xanthoxyloides Wall.	Thum	T	1800-2900	Reg Himal	Twigs	Used in Buddhist religious ceremonies especially in havans to keep away evil spirits.

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
Onagraceae						
Epilobium angustifolium L.	--	H	3000-4300	Europe	Flowers	Locals wear it on caps in Aasharang Ramdus.
Epilobium latifolium L.	--	H	3300-4200	Sibiria	Flowers	Locals wear it on caps in Aasharang Ramdus.
Orchidaceae						
Calanthe tricarinata Lindl.		H	2900-3500	Reg Himal	Leaves	Locals wear it on the caps during the Dakhrain festival.
Dactylorhiza hatagirea (D. Don.) Soó	Salampanja	H	2500-4000	Europe Afr Bor Oriens Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Orobanchaceae						
Pedicularis bicornuta Klotzsch[#]	--	H	2400-4500	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Pedicularis longiflora Rudolph	Lug ru serpo	H	2300-5000	Sibir Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Pedicularis pectinata Wall. ex Benth.	--	H	2100-5000	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Papaveraceae						
Meconopsis aculeata Royle	--	H	3000-4050	Reg Himal	Flowers	Used in Phulaich festival.
Plantaginaceae						
Lagotis kunawurensis Rupr.	Papning, Tapning	H	3900-5600	Reg Himal	Flowers	Used in Phulaich festival.
Picrorhiza kurroa Royle ex Benth.	Kadu	H	3300-4300	Reg Himal	Roots	Used in Phulaich festival.
Poaceae						
Arundo donax L.	Rajal	H	1320-3750	Reg Mediterr Oriens	Branches	Used in the preparation of baskets and kilta for flower collection in Phulaich festival.
**Eleusine coracana* Gaertn.	Kodro	H	1800-3400	Amer Austr Ind Or Egypt	Seeds	Used for worshipping deities.
**Hordeum vulgare* L.	Tak, Chak, Cha	H	1400-4000	Eurasia	Seeds	Used for worshipping deities in Phulaich, Khakcha, Beesh, Losar, Diwal, Lamoch, Misto, Mag, Sazo, Mang Neeza and Songya festivals. In Buddhist death, birth and marriage ceremonies 'Torma' and 'Pya' are prepared from kneaded flour of *Hordeum vulgare* for worshipping deities and other supernatural powers.
Poa alpina L.	Gyalchee, Yalchee	H	2400-4000	America	Leaves	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival and also offered to deities. At the end of the festival, flowers are distributed among the villagers.
**Setaria italica* (L.) P. Beauv.	Shag, Kagni	H	1500-3500	Reg Trop et Subtrop	Seeds	Used for the worshipping deities in the Lamoch festival.

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
**Triticum aestivum* L.	Jod	H	1300-3500	Western Asia	Leaves	Knit flour is used for making traditional food 'Poltu or Pole' which is used in worshipping deities in festivals, marriages and birth and death ceremonies.
**Zea mays* L.	Chaliya	H	1350-2900	Mexico	Seeds	Used in Homering festival.
Polygonaceae						
Bistorta affinis Greene[#]	Shueg Seelang, Ramu	H	3050-4270	Reg Himal	Flowers	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival and offered to deities. At the end of the festival, flowers are distributed among the villagers.
**Fagopyrum esculentum* Moench	Olgo, Ogla, Ogli	H	1350-4400	Europe As Bor	Seeds, Straw	Special traditional food 'Ghashang Hood' is used in worshipping deities in Losar, Khakcha and Lamoch festivals.
**Fagopyrum tataricum* (L.) Gaertn.	Bras	H	1350-3650	Europe As Bor	Seeds, Straw	Special traditional food 'Brasu Hood' is used in worshipping deities in the Lamoch festival.
Persicaria campanulata (Hook.f.) Ronse Decr.	--	H	1400-4100	Ind Or	Flowers	Locals wear it on caps in Aasharang Ramdus.
Persicaria wallichii Grauter & Burdet	Chuti	H	2500-2700	As Temp	Flowers	Used in Phulaich festival.
Rheum australe D. Don[#]	Archa, Arch	H	3000-3200	Reg Himal	Roots	Used in Phulaich festival.
Rheum spiciforme Royle[#]	Archa, Arch	H	3000-4800	Reg Himal	Roots	Used in Phulaich festival.
Primulaceae						
Primula denticulata Sm.[#]	Phanting Uh	H	1500-4500	Reg Himal	Flowers	Used by monks for marriage prediction.
Primula obtusifolia Royle	Devizanks	H	3600-5300	Reg Himal	Flowers	Used for worshipping deities in Ho Ho and Phulaich festivals.
Primula prolifera Wall.	Jai vijal	H	2900-3500	Reg Himal	Flowers	Used for worshipping deities in Ho Ho festival.
Ranunculaceae						
Anemone obtusiloba D. Don	--	H	2900-3600	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Anemone rivularis Buch.-Ham. ex DC.	--	H	1500-3500	Ind Or	Flowers	Locals wear it on caps in Aasharang Ramdus.
Aconitum violaceum Jacq. ex Stapf.[#]	Bangat Kaisar	H	3600-4800	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Caltha palustris L.	--	H	2500-3200	Reg Bor Temp et Arct	Flowers	Locals wear it on caps in Aasharang Ramdus.
Delphinium cashmerianum Royle	Loskarch	H	2700-4880	Reg Himal	Flowers	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival and offered to deities. At the end of the festival, flowers are distributed among the villagers.
Delphinium glaciale Hook.f.	Loskarch	H	3300-6500	Reg Himal	Flowers	Flowers are used in the preparation of bouquets (Chera) in

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
& Thomson						the Phulaich festival and offered to deities. At the end of festival, flowers are distributed among the villagers.
Delphinium brunonianum Royle	Loskar, Donang Uch	H	4300-5500	Reg Himal	Flowers	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival and offered to deities. At the end of the festival, flowers are distributed among the villagers.
Ranunculus hirtellus Royle	Chip-Chi	H	1800-4800	Reg Himal	Flowers	Used in Phulaich festival.
Ranunculus laetus Wall. ex Hook.f. & Thomson	--	H	1350-3200	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Rosaceae						
Potentilla argyrophylla Wall. ex Lehm.	--	H	2100-4000	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Potentilla atrosanguinea G. Lodd. ex D. Don.	--	H	2100-4000	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Prinsepia utilis Royle	Bhekal	Sh	1320-3000	Reg Himal	Twigs	Used in marriage ceremonies to keep away evil spirits.
**Prunus armeniaca* L.	Chul, Chuli	T	1500-3500	Reg Caucas	Twigs, Flowers, Fruit, Seeds	Twigs and flowers are used in Sazo, Chulfloring, Losar, Gurusangyas and Basant Panchami festivals. A traditional alcoholic beverage known as 'Chul Rak' is used to worship deities and consumed by locals in marriage, birth, death and other ceremonies. Seeds are used for the preparation of garlands known as 'Chik Maling' which is given to the bride, groom and family members and guests as a token of love and respect.
**Prunus mira* Koehne	Reg	T	1800-3500	China	Branches, Fruits	Branches used in Khepa and Basant Panchami festivals for preparation of special dish 'Dhu rang Mar'. The traditional alcoholic beverage 'Regu Rak' is used to worship deities and consumed by locals in marriage, death, birth and other ceremonies.
Pyrus pashia Buch.-Ham. ex D. Don	Kainth	T	1320-2200	Reg Himal	Branches	Used in hawans.
Rosa brunonii Lindl	Yal	Sh	1320-3300	Reg Himal	Twigs, Flowers	In the Khepa festival, people hang twigs on the main door to keep away evil spirits. Locals also wear flowers on their caps.
Rosa webbiana Wall. ex Royle	Lama uh	Sh	2200-3800	Reg Himal	Twigs, Flowers	People hang twigs on the main door to keep away evil spirits. Flowers are also offered to deities.
Rutaceae						
Skimmia laureola Franch.	Shushur	Sh	2600-3200	Reg Himal	Leaves	Locals wear it on caps in marriage ceremonies.

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
Solanaceae						
**Solanum tuberosum* L.	Halu	H	1350-3500	Amer Bor el Austr	Flowers, Tubers	In older times used in a marriage ceremony to perform a special ritual 'Saining Kolsham'.
Saxifragaceae						
Bergenia stracheyi (Hook.f. &Thomson) Engl.	Rachu Kanang	H	3300-4000	Reg Himal	Leaves	Flowers are used in the preparation of bouquets (Chera) in the Phulaich festival.
Tamaricaceae						
Myricaria elegans Royle	Hombu	Sh	2700-4000	Reg Himal	Twigs	Used in religious ceremonies, especially in hawan.
Myricaria squamosa Desv.	Hombu	Sh	2400-4600	Caucasus Central Asia China	Twigs	Used in religious ceremonies, especially in hawan.
Thymelaeaceae						
Daphne mucronata Royle	Jikog, Aagru, Jiko	Sh	2100-2900	Reg Himal	Twigs	Used in Buddhist religious ceremonies especially to keep away evil spirits.
Daphne oleoides Schreb.	Jikog, Aagru, Jiko	Sh	2000-2700	Europ As Min	Twigs	Used in Buddhist religious ceremonies especially to keep away evil spirits.
Datura stramonium L.	Datura	H	1320-2600	America	Fruits	Offered to lord Shiva in Shivratri festival.
Viburnaceae						
Viburnum cotinifolium D. Don	Tusrus	Sh	1800-3600	Reg Himal	Flowers	Locals wear it on caps in Aasharang Ramdus.
Vitaceae						
**Vitis vinifera* L.	Dakhang	Sh	1350-2800	Oriens Ind Bor Occ	Fruits	Traditional alcoholic beverage 'Dakhang Rak or Angoori or Shudang' is prepared from fruits and used for worshipping deities and consumed by locals at birth, death, marriages and festivals.
Gymnosperms						
Cupressaceae						
Juniperus indica Bertol.	Shur, Shukpa	Sh	2600-5200	Reg Himal	Leaves	Used as incense in every house and temple.
Juniperus polycarpos C. Koch	Shur, Shukpa	T	2400-3300	Persia Reg Himal	Leaves	Used as incense in every house and temple.
Juniperus squamata Buch.-Ham. ex D. Don	Shur, Shukpa	Sh	1600-4500	Reg Himal China	Leaves	Used as incense in every house and temple.
Pinaceae						
Cedrus deodara (Roxb. ex D. Don) G. Don[#]	Kyalbang	T	1400-3000	Reg Himal	Branches, Twigs	Used for making huts in Phulaich festival. Locals wear twigs on caps during last day of the Phulaich festival for performing a special dance known as 'Yam Kayang'.
Pinus gerardiana Wall. ex D. Don[#]	Ree, Neoza	T	1800-3300	Reg Himal	Stem, Twigs, Seeds	Flakes of stema are used as torchwood for performing the special torchwood dance 'Sang Puling Chasham'. Locals wear twigs on caps during the last day

Family/Taxa/ Voucher number	Local Name	Habit	Altitudinal Range	Nativity	Part used	Usage pattern
						of the Phulaich festival for performing a special dance known as 'Yam Kayang'. Seeds are used for the preparation of garlands known as 'Ree Maling' which is given to the bride, groom, family members and guests as a token of love and respect.
Pinus wallichiana A.B. Jacks.[#]	Lim	T	1800-3200	Reg Himal	Stem, Branches	Flakes of the stem are used for performing torchwood dance during the Ho Ho festival. Branches were kept on the main door as a curtain in Chilgoza huts during the Phulaich festival.

Abbreviations used: T = Tree; Sh = Shrub; H = Herb; Reg = Region; Himal; Himalayan; As = Asia; Trop = Tropical; Temp = Temperate; Bor = Borealis (Northern); Ind Or = Indian Occidetal; Oriens = Oriental region; Mediterr = Mediterranean; Occ = Occidetalis; [#] = Near Endemic; * = Cultivated/ornamental

Of the total 105 plants recorded, 52 species are native to the Himalayan Region and 24 species to the Himalayan and other biogeographic regions together. The remaining species are non-natives to the Himalayan region. Different part(s) of the plants are utilized, of which the flowers are used in the majority (57 species), followed by twigs (15 species), leaves (13 species), seeds/grains (11 species), branches (7 species), roots (5 species), fruits (4 species), stems and straw (2 species each), nuts, tubers, silky hair on seeds and winged seeds (1 species each) (Fig. 2). These parts are used by the inhabitants to make bouquets for festivals, worship deities, ward off evil spirits and are used in marriage, death, birth and other religious ceremonies.

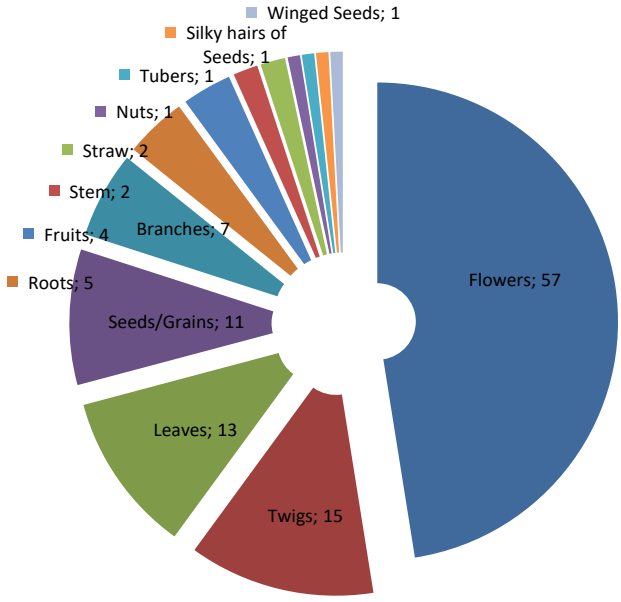

Fig. 2. Parts of plants used in socio-cultural traditions by Kinnaura tribes

Aconitum violaceum, *Bistorta affinis*, *Carex nivalis*, *Cassiope fastigiata*, *Cedrus deodara*, *Corydalis govaniana*, *Himalaiella heteromalla*, *Jurinea macrocephala*, *Morina*

longifolia, *Pedicularis bicornuta*, *Pinus gerardiana*, *Pinus wallichiana*, *Primula denticulata*, *Rheum australe* and *Rheum spiciforme* were near endemic to the Indian Himalayan Region.

The altitudinal distribution of the plants used in socio-cultural traditions by Kinnaura tribes shows the highest number of 81 species subalpine altitudinal zone (2800-3500m) followed by 75 species in the temperate zone (1800-2800 m), 61 species in the high-altitude alpine zone (> 3500m) and 41 species in the lower-most altitudinal zone (< 1800) (Table 2).

Off the total 105 species recorded, 13 species are in the different threat categories of the International Union for Conservation of Nature (IUCN) red list *Dactylorhiza hatagirea* and *Picrorhiza kurroa* were endangered; *Aconitum violaceum* was vulnerable; *Pinus gerardiana* near threatened; and *Betula utilis, Juglans regia, Caltha palustris, Myricaria elegans, Juniperus indica, Juniperus polycarpos, Juniperus squamata, Cedrus deodara* and *Pinus wallichiana* were least concern. Nine (9) species are in the different threat categories of CAMP 2010, *Dactylorhiza hatagirea*, *Jurinea macrocephala* and *Picrorhiza kurroa* were critically endangered; *Arnebia euchroma, Betula utilis* and *Saussurea obvallata* were endangered; *Rheum spiciforme* was near threatened; and *Aconitum violaceum* and *Skimmia laureola* were vulnerable.

The present study revealed that the plants are contributing significantly to keeping intact their traditional culture viz., birth, death, marriage, festivals, rituals and other ceremonies of Kinnaura tribes and this age-old (time immemorial) plant-human relationship is maintained through generations to generations.

Conclusions

Natural resource conservation is particularly important and effective when expertise is combined with understanding and awareness of local community cultural practises [44, 45]. Culture and religion-based biodiversity conservation is more effective and efficient than legislation or regulation [46]. Local groups that practise and preserve their traditional ceremonies can preserve genetic resources, particularly those related to the use of diverse plants in traditional rites [47]. However, traditional knowledge of the usage of natural plant resources is crucial for the conservation of biodiversity [48] and also supports the convention of Biodiversity in the sustainable utilization of natural resources.

India has a long tradition of worshipping plants in order to perform rituals in socio-cultural activities. Because of the belief in the magical powers of plants, they are venerated and offered to their deities in order to obtain blessings, good health and prosperity. Such ingrained confidence in ancestors' ideas not only helps the locals maintain their mental, physical and emotional stability, but it also makes a substantial contribution to their solidarity and cultural identity. Fear of deities and other supernatural powers also contributes to the conservation and sustainable utilization of these plants because locals impose self-collection/harvesting rules.

The Kinnaura tribe has also preserved their cultural heritage from generation to generation by maintaining their socio-cultural traditions and for performing the majority of traditional rituals they rely on plant species available in their surroundings. The respondents said during the debate that each plant's function and significance in traditional ceremonies were predetermined by their ancestors and could not be replaced by another variety of plants. Currently, due to increasing demand, over exploitation and habitat degradation especially the construction of hydropower projects, roads and buildings, the population of the preferred species are depleting rapidly.

In addition, due to westernization, tourism and apple-based improved economic conditions and outmigration of locals in urbanized areas for government or private jobs and education of kids are also significantly influencing socio-cultural traditions of Kinnaura tribes and the impact is visible in the form of their changed lifestyle like food habits and clothing, socio-cultural and livelihood patterns. Thus, for maintaining the ecological balance there is a

dire need to protect and conserve socio-culturally important plants and associated traditional knowledge for which assessment of natural populations, demand and supply studies, harvesting trends, developments of propagation methods, afforestation of highly preferred species in degraded lands and community awareness for sustainable utilization and conservation of traditional knowledge have been suggested.

Acknowledgments

The authors are thankful to the Director, ICFRE-Himalayan Forest Research Institute, Panthghati, Shimla, Himachal Pradesh for facilities and encouragement. We are also thankful to the tribal communities of Kinnaur district for providing vital information on the usage of various plant species in socio-cultural traditions.

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Received: October 20, 2023
Accepted: May 2, 2024